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ABSTRACT

Some authorities on technolgoy transfer feel that industry is not fully capitalizing on the inventive output of universities and nonprofit organizations. From the point of view of the government, the stakes are high. The magnitude of federal support of research and development in these organizations demands evidence of useful results if it is to be continued. The University Subcommittee on Patent Policy, an interagency group ultimately responsible to the Federal Council for Science and Technology, reviewed the difficulty of the university in technology transfer, and identified some reasons for the universities not achieving optimum results: (1) universities do not generally have adequate management capability to transfer research results to the industrial concerns that might make use of them; (2) the "not-invented-here" syndrome, in which industrial concerns prefer to use their own ideas rather than the ideas of others; (3) uncertainty over ownership of inventions collaboratively developed or generated; and (4) contamination, or potential compromise of rights in proprietary research that parallels university research, resulting from exposure of the private organization to ideas, compositions, and/or test results arising from government-sponsored research. It may be necessary for the government to persuade universities to provide technology management capabilities by guaranteeing patent rights in exchange for the development of such capabilities, thus eliminating some of the problems just enumerated. (MSE)

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Presentation of Norman J. Latker before National Congress on "The Availability of New Technology to Industry from American Universities and Technological Institutes"

First, I'd like to express my delight in being able to attend and be a part of this conference. I believe Dr. Dvorkovitz should be congratulated for taking one of the first initiatives to move into a void that many have long felt must be filled.

It has been the opinion of a number of scientific authorities on technology transfer that industry is not fully capitalizing on the inventive output of universities and non-profit organizations (hereinafter referred to as "universities"). Early in 1972, the country's leading scientists had reported to the White House as an "urgent situation" ". . . continuing failure of industry, universities, and Government to cooperate in developing civilian technology in the way they produced defense, space, and atomic tools."

Today the principals are gathered here in a practical attempt to respond to such criticisms.

From the point of view of the Government and the public, the stakes are very high. The sheer magnitude of Government support of research and development at universities demands evidence of useful results if it is to be continued in the prevailing competition for the Federal dollar. In Fiscal Year 1970, approximately $3 billion of the $12 billion, or one quarter of that spent by the Government on research and development outside its own laboratories went in the form of grants and contracts to universities. DHEW's former

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Assistant Secretary for Health and Scientific Affairs recently quoted an Office of Management and Budget official as stating:

> "You have got to find some way to justify the return the public is getting from the large investment which has been made in health over the recent years by the Federal Government. In this regard, no one else is at such an increasing disadvantage as is health in competing for scarce funds."

My own belief is that this indication for need for identifiable results will be part of OMB's review of all agency research programs. Please note my emphasis on the word "identifiable". I am not at all convinced that because inventive results are not readily identifiable as being generated with Government support that meaningful bases of scientific information upon which industry builds are not being generated. Notwithstanding, it appears evident that a better job of transfering technology from the universities can and should be accomplished.

Of course, in those situations where Government funds are involved in supporting university research, all three principals need to sharpen their performance.

Some of the Government's efforts in reviewing its part in the technology transfer problem is taking place in the University Subcommittee on Patent Policy, an interagency group ultimately responsible to the Federal Council for Science and Technology.

At the outset of its study, the Committee identified some

general premises from which it would be necessary to proceed:

First, a sympathetic and encouraging Federal climate is very important to technological progress. Thus, in cases where the requirement for university/industry relations is not met in a satisfactory manner, Government can have an important role to play as a catalyst or "impresario" in creating the framework within which regular contacts take place between university and industry.

Second, the University community and industry, left to their own initiatives, will probably be unable to generate this atmosphere. Private business, even though concerned with institutional barriers that preclude systems innovations, can't do much about it. They are responsible for outputs of their businesses, and must ordinarily work within the narrow confines of the companies' responsibilities to maximize profits and minimize risks for the firm.

Third, there appears to be an absolute need for industrial collaboration with universities if the results of Government-sponsored university research are to reach the marketplace. Of course this is true because much of the work performed under Government-sponsored grants and contracts at universities is basic, as opposed to applied, research. Inventions arising out of basic research involve at most compositions of matter with no clear utility, prototype devices, or processes which usually require much additional development. Universities themselves do not undertake the complete development of such inchoate inventions to bring them to the point of practical application, as development leading to commercial marketing is not ordinarily

within the scope of their missions. Further, financing of that type of development work that might be used by such institutions is not generally available from Government sources. Consequently, development in such cases will generally be accomplished only where industry has knowledge of them and has an incentive to utilize its risk capital to bring such inventions to the marketplace. Even in those fewer instances where the university has undertaken applied research, ultimately industrial aid will be required in bringing the invention to the marketplace. Since the public institution and the industrial concern are two different organizations not only physically separated, but often having different goals, it can be expected that collaborative development arrangements will be difficult to achieve.

Last, the difficulty of collaboration is compounded when those who now perform essential parts of a function refuse to modify their operations to meet the needs of the whole system. (I am not excluding the Federal Government as one of the principals who must modify its operations.) These vested interests constitute by far the most serious institutional barriers to socially important innovations. Ordinarily, the principals can't be ordered to collaborate. Nor will they do so unless they see something in it for themselves. <u>The problem is how to provide the means for inducing them to integrate voluntarily into a system that performs a socially desirable function</u>.

With these matters in mind, the University Subcommittee began its review of the university difficulty in transferring the results of its research to industry. The following were considered to be the primary reasons for at least the appearance of not achieving optimum results:

First, and thought to be the most important, was the conclusion that universities do not generally have an adequate management capability to facilitate the transfer of their inventive results to industrial concerns that might make use of them. Even those organizations having the right to transfer a degree of patent protection desired by industry may well fail to succeed in encouraging utilization if an adequate, organized effort to communicate these results is not made.

Most authorities do not believe that the mere existence of a body of research outputs and other technical knowledge is enough to result in significant industrial innovation.

It is felt that to transfer scientific or technical information into specific innovations requires a certain amount of organized effort.

In sum, a good communications system does not just happen accidentally; management must take deliberate, specific action to devise and keep open necessary communication channels. It must also give explicit attention to its goals.

Of course, today we have with us a number of universities who have generated the type of management capability discussed above,

and every day the number of additional universities forming such management capabilities is increasing in response to the demonstrated need.

What other problems impede technology transfer?

Well, second, I would identify the "not-invented-here" syndrome. Industrial organizations have commercial positions in most areas of their research. Accordingly, there is an in-house incentive for such organizations to further develop the results of their research in order to improve their commercial position. This incentive stems from the organization's ability to continuously evaluate their research through all stages of its development. It is presumed that there will be a lesser incentive for industry to further develop the results of university research where such research will not be under its initial review or control. It was suggested that this bias toward investment in further development of its own ideas, rather than ideas from outside sources, might be lessened by early identification by industry of university investigators who may be working in their areas of interest.

Notwithstanding the "not-invented-here" syndrome, I would note that the Proceedings of the Conference on Technology Transfer and Innovation, sponsored by the National Science Foundation in 1967, noted that innovating companies depend on a relatively small number of professionals called "cosmopolites" to communicate

with outsiders and bring important new information into the firm. This information is in turn passed on to the rest of the staff, referred to as "locals". About one-half of the 560 innovations studied in the above-cited conference were based on technological information horizontally transferred to the firm. This, of course, confirms the importance of outside information and suggests the expanded use of "cosmopolites" or the use of outside organizations such as Dr. Dvorkovitz' and Research Corp. in lieu of inside "cosmopolites". One of the best examples of an inside "cosmopolite" group I'm familiar with is the University Relations Branch of Merck and Company.

Third, is the uncertainty over ownership of inventions made at universities that may be collaboratively developed or are generated through a collaborative relationship.

Some agencies of the Government have noted situations of industry refusal to collaborate with public institutions in bringing their inventions to the marketplace unless provided some patent protection as quid pro quo for additional investment and development required.

This was substantiated by the Harbridge House Study and the GAO Report on Medicinal Chemistry. Both of these studies indicated an industry-wide reluctance by pharmaceutical firms to test compositions of matter synthesized or isolated by Department

of Health, Education, and Welfare grant-supported investigators due to DHEW's patent policy, which industry felt failed to take into consideration the large private investment before such compositions could be marketed as drugs. Although not as extensively documented, similar situations have occurred in the area of medical hardware devices.

The Harbridge House Study, when discussing university and non-profit institution inventions, indicated that:

> "In both cases, the inventions most frequently arise from basic research and require substantial private development before reaching the stage where they are commercially useful. Some measure of exclusive rights appear necessary to motivate licensees to invest in the work necessary to commercialize these inventions."

It follows from the experiences noted in university dealings with the pharmaceutical industry and medical device manufacturers that there probably is a reluctance to collaborate with universities in bringing high-risk inventions to the marketplace if some patent exclusivity is not first provided to the developer. In my opinion, this problem will be compounded by the passage of pending medical device legislation which would require evidence of clinical testing prior to marketing due to the added risk capital required for testing.

Fourth, is the problem of contamination. As used by industry and institution investigators, "contamination" means the potential compromise of rights in proprietary research resulting from exposure of an organization to ideas, compositions, and/or test results arising from Government-sponsored research. For example, an invention made at an institution under a Government-funded research program is looked into by a company doing parallel research. If the company incorporates into its research program some of the research findings of the institution and then develops a marketable product patentably distinct from the institution's invention, the company fears that the Government is in a position to assert claims to their product.

The above had the effect of persuading the Subcommittee that the Federal Government needed to act to create an atmosphere conducive to the transfer of inventive results from universities to industry.

To overcome the above barriers to technology transfer, it appeared essential to the Subcommittee that the Government persuade universities to provide a management capability within the institution that will serve as a focal point for receipt of the inventive results of institutional research for later dissemination by itself or other management organizations to those industrial concerns most likely to utilize such results. It was the conclusion of the Subcommittee that this might be accomplished by guaranteeing to universities at the time of funding patent rights in Government-supported inventions in return for establishment of a management

capability created to undertake transfer of the inventive results of university research. The guarantee of patent rights to the university carries with it the right to license commercial concerns, thus creating the incentive necessary for development in those situations where collaboration would not otherwise be accomplished and lessening or eliminating industry fear of contamination. Further, under such a policy, collaborative arrangements could be made wherein industry's participation is protected before it is even clear whether or not inventions will be made. Such prior arrangements should minimize the problem of the "not-invented-here" syndrome, since a collaborator would not be viewed as an "outsider".

As noted previously, the Subcommittee identified the problem as finding the means to induce voluntary integration into a system that results in technology transfer. We believe our recommendation provides such an inducement for all three of the parties involved through recognition of their equities.

First, the Government, as the representative of the public, would have created the atmosphere necessary to transfer the results of university research to the marketplace where the taxpayer may utilize it. Of course, such end products will increase the nation's potential to employ labor and raise the level of its exports. Further, industrial participation will increase the Government's ability to focus public funds on the kinds of research and development which have high, long-run social value, but could not be undertaken by

industry alone due to the risk involved and the initial poorly defined profit opportunities. Rights will be reserved under the policy to assure against individual abuse of the privileges retained by the university and industry.

Second, the university will be permitted to recover royalties through the licensing of their inventions. The policy requires that a substantial portion of royalty receipts be utilized for educational or research purposes, with a lesser portion available for distribution to inventors. Further, ownership in the university will permit the University to pursue or direct development of the invention as it deems appropriate.

And third, industry's investment can be protected through some exclusivity.

The basic recommendations of the Subcommittee are still under review. However, at the present time, the Department of Health, Education, and Welfare (DHEW) and the Department of Defense (DOD) have policies similar to that recommended, which guarantee selected institutions who have previously demonstrated a patent management capability and/or a patent policy considered in the public interest a first option to administer title to inventions generated with Department support, subject to conditions considered necessary in the public interest. The DOD policy extends only to inventions that are generated under grants and contracts that do not fall within the provisions of Section 1(a) of the President's Statement. DOD

grants and contracts with institutions that are identified as falling within Section 1(a) contain patent clauses that give the Government the first option to any inventions made in performance of the contract.

I have been advised that the National Science Foundation will within the next few weeks issue regulations which will substantially follow the recommendations of the Subcommittee. Further, I am advised by NASA that NASA regulations presently provide for Institutional Patent Agreements (IPA's) with universities NASA deems to have adequate patent management capabilities. I understand that both agencies are willing to entertain requests for IPA's.

I think it is important to note that the total amount of funds administered by the above four agencies for use in funding university research approximates $2 billion of the $3 billion noted above. The remaining $1 billion is administered by the remaining Executive agencies, the largest portion of which is $630 million being administered by A.E.C.

Although I cannot predict how each of the four above agencies will treat individual university request for IPA's, I believe it fair to say that the concept of IPA's is here to stay and grow because it basically reflects a grass-roots desire.

Before closing, I would like to pass to a slightly different topic. In the same report to the White House mentioned earlier, it was also noted as an "urgent situation" ". . . a still-growing 'technological gap' versus Japan and West Germany -- areas steadily

pulling ahead in exports of many high-technology products." I believe there is a growing body of evidence that some of the products generated by these countries are the outgrowth of university technology. It seems to me that the IPA program could be a partial response to this problem if it encourages the timely filing of both domestic and foreign patent applications. Of course, the filing of foreign patent applications is an expensive matter which could be resolved by a meaningful Patent Cooperation Treaty, which I encourage you to support whenever possible.